



Effects of organic and inorganic manure on the yield and yield components of upland irrigated rice in Owerri South East Nigeria

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General Note



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ABSTRACT

A research was conducted to assess the performance of irrigated upland rice grown using organic and inorganic manure on an *Ultisol* at the Centre for Agricultural Research and Extension, Federal University of Technology, Owerri. The experiment comprised of

Control (Cl), Urea (Ua) at 400 kg.ha⁻¹, Rumen digesta (Rd), and Poultry dropping (Pd) and Pig slurry (Ps) at a flat rate of 20 t.ha⁻¹ each. The 5 treatments were replicated five times to give a total of 25 plots. Each plot measured 2×2 m with a 1 m alley between plots. The test crop was CP 306 upland rice variety. Agronomic parameters of rice such as number of leaves, leaf area index, tiller number and total biomass yield were measured. The weight of 1000 seeds, percent filled and unfilled grains were also measured. The experiment was laid out in a randomized complete block design (RCBD). The data resulting from the experiment was subjected to analysis of variance (ANOVA) and significant differences were separated using Fisher's least significant difference at $P = 0.05$. The result from the analysis of the growth parameters showed that there were significant differences in root weight, shoot weight, total biomass, shoot length, leaf area index and tiller number of the plants when the control was compared with the treatments and when the treatments were compared with one another. Pig slurry treated plot again proved to be superior by having dominant positive effect on the measured parameters. There were further significant differences revealed by the yield characteristics of the grains when the treatments were compared with the control and when they were compared with one another. In conclusion, plot treated with pig slurry have the overall positive effect on the crop growth, and yield parameters of the test crop.

Keywords: Organic and inorganic manure, yield and yield components, upland rice, Owerri Nigeria.

1. INTRODUCTION

Rice is currently the second most important staple food after maize in Nigeria and its consumption keeps increasing as a result of population growth, urbanization and change in consumer habits. Nigeria is known to have comparative resource advantage in terms of favorable climatic, edaphic and ecological conditions in the production of rice for self-sufficiency (Imolehin and Wada, 2005), yet the actual yield of rice in Owerri and even Nigeria at large is not up to its expected potential and this explains why the importation of rice into the country is at an alarming rate (Babatunde *et al.*, 2016).

Therefore to achieve increased yield of upland rice in Owerri, the use of improved technologies such as incorporation of appropriate quantities of organic and inorganic fertilizers, good irrigation water, improved rice seed variety etc has to be given serious consideration. Hence several field research reports have indicated that high and sustainable rice yields are possible in the tropics using organic and inorganic fertilizer (Satyanarayana *et al.*, 2002). The use of organic fertilizers (especially ruminant dung, poultry droppings, household refuse and effluents) for crop production is an age-old agricultural practice among subsistence farming communities in the West African sub-region (Lombin *et al.*, 1991). Organic fertilizers have been used to improve soil chemical properties especially decreasing acidity and improving the humus content of the soil (Spaccini *et al.*, 2002; Olanikan, 2006). They are highly effective, environmentally safe and biologically justified mostly on degraded soils (Ojobor *et al.*, 2014). On the other hand, inorganic fertilizers are essential component of modern farming. However, excessive, frequently uncontrolled and routine use of inorganic fertilizers adversely affects soil chemical properties (acidity, toxicity and nutrient imbalance), yield efficiency and soil quality.

However many developing countries (for example Nigeria), the likelihood of obtaining enough synthetic fertilizers to meet the food crop requirements of the farming population is remote (Edeh, *et al.*, 2015). Although organic fertilizers has long been recognized as the most desirable organic fertilizer to improve soil quality but sustainable production of crops cannot be maintained by using organic fertilizers alone mainly due to also their unavailability in desirable amount. Therefore complementary uses of inorganic fertilizers have to be made (Sarker *et al.*, 2011).

Irrigation on the other hand is an important tool for agricultural yield improvement (Caruthers, *et al.*, 1997; FAO, 2003; Domenech and Ringler, 2013). The development of irrigation contributes by increasing returns to smallholder farmers in terms of making food available all year round and achieving higher yields and revenues from crop production (Husain and Hanjra, 2004). Hence with organic fertilizer, inorganic fertilizer and irrigation, it is possible to harvest rice 3-4 times a year in Owerri and the country at large. Therefore this research aims at determining effects of organic and inorganic manure on the yield and yield components of upland irrigated rice in Owerri South East Nigeria.

2. MATERIALS AND METHOD

A. Description of Study Area

The study was conducted at the Centre for Agricultural Research and Extension (CARE) of the Federal University of Technology Owerri (Figs.1 and 2). CARE is situated in FUTO which is bounded by the communities of Eziobodo, Umuchima, Ihiagwa, and Obinze. The study site lies in the high rainfall humid tropics located between latitude 5° 22'N and longitude 6° 59'E with elevation of 55m above sea level. It has a mean annual rainfall of between 1800 - 2,500 mm and mean temperature range of 27°C – 30°C. The rainfall

pattern is bimodal with peaks in the months of July and September, and short dry spell in the month of August, known as August break. The hydrology of the area is governed by Otamiri River. The main vegetation of the area is rainforest which has been reduced to secondary plant due to anthropogenic activities.

B. Land preparation

Materials used in the field included;

Matchet, spade, hoe, core sampler, masking tape, net, scare crow, insecticide, herbicide, polythene bags, book, auger, Global Positioning System (GPS). Land preparation was done as described by ploughing and harrowing using farm tools. Sunken beds were made using hand hoes.

C. Experimental Layout and Treatment Application

The experiment was laid out in Randomized Complete Block Design (RCBD) Fig.3. Each plot measured 2×2 m and 1m alley within plots and within blocks. A total of 14×14 m size of land was used for the research.

D. Treatments

Urea was sourced from FUTO Farms Ltd, Rumen digesta was sourced from Obinze Abattoir in Owerri West L. G. A and Poultry dropping was sourced from FUTO Farms Ltd while Pig slurry was sourced from Doorway Farms in Ubowalla Emekuku, Owerri North L.G.A. The treatments were applied 2weeks before seeding except the urea which was applied 2 weeks after germination. The treatments were allocated to the plots randomly and a total of 5 treatments with 5 replicates were used. The treatments comprised of;

Control (Cl) (no treatment applied)

Urea (Ua) at 400 kg.ha⁻¹

Rumen digester (Rd) at 20 t.ha⁻¹

Poultry droppings (Pd) at 20 t.ha⁻¹

Pig slurry (Ps) at 20 t.ha⁻¹

E. The Test Crop

The test crop was CP 306 upland rice. CP 306 was sourced from Ebonyi State Agricultural Development Program (EBADP).The rice seedlings were sown directly by dibbling at a seed rate of 60Kg/ha. Thinning was done 3 weeks after germination (WAG) to maintain 3 stands per hole and a planting distance of 30cm within row and 25cm between row spacing with a plant population of 399,999 stands per hectare. The farm received 2inches of irrigation water per/day to give about 60cm water penetration into the soil using 3arm rotary sprinkler system. Irrigation application continued until after dough stage of the seed formation. No water was applied during the grain drying. Weeding of the farm was done manually as frequently as the need arose.

F. Grain Yield

Grain yield weight were obtained by harvesting rice from one meter square area in each of the plot and then weighed. The paddy was then adjusted to 14% moisture content according to Gomez (1972), and then the grain weight for each plot was recorded and converted into t.ha⁻¹

$$\text{Adjusted grain yield} = (A \times W) \dots \dots \dots \text{equ (1)}$$

$$\text{Adjusted Coefficient Computed by } A = \frac{100-M}{86} \dots \dots \dots \text{equ (2)}$$

Where A is adjustment coefficient, M is the moisture content (%) of the harvested grains and W is the weight of the harvested grains.

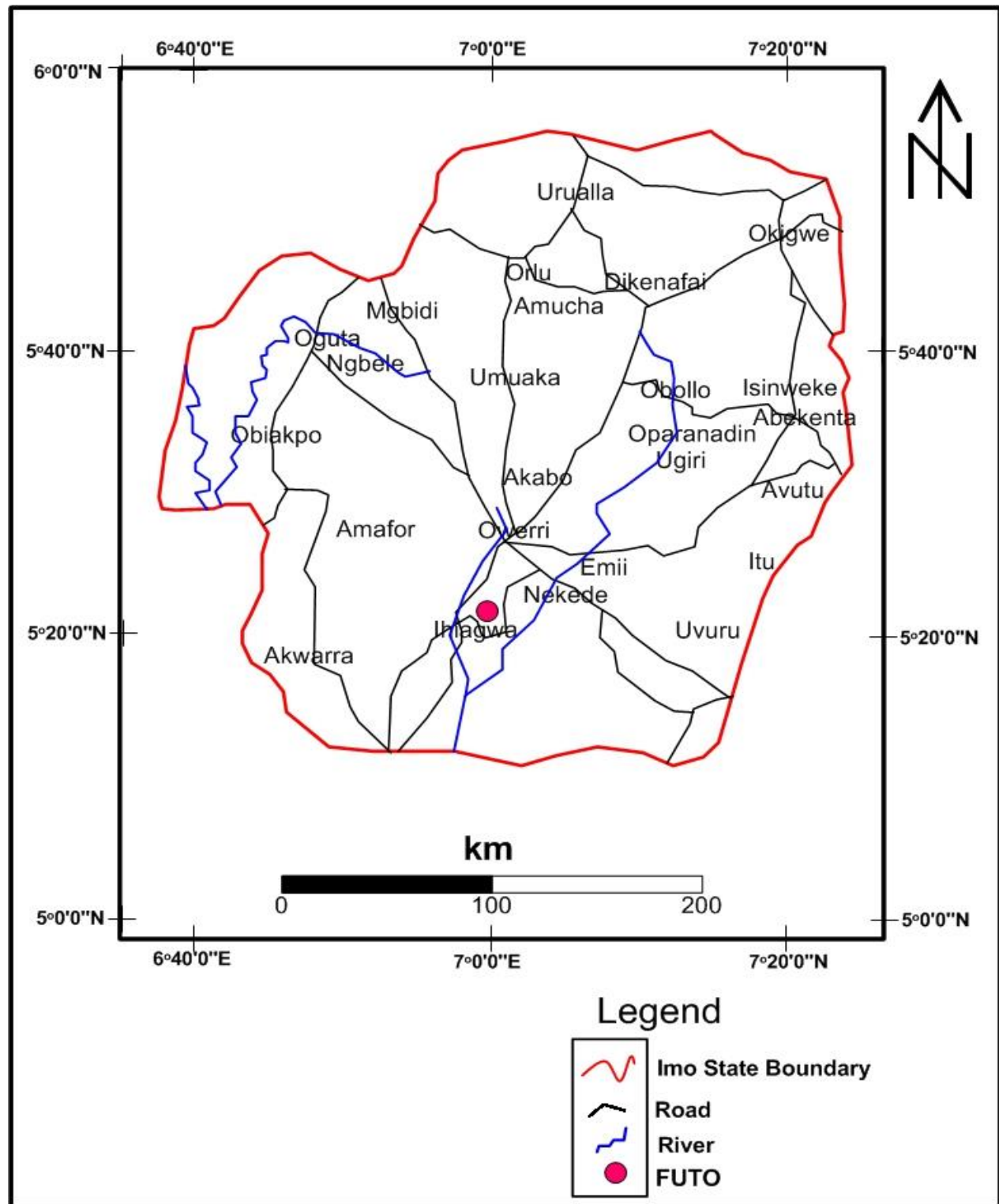


Figure 1: Map of Imo state showing study area (FUTO)

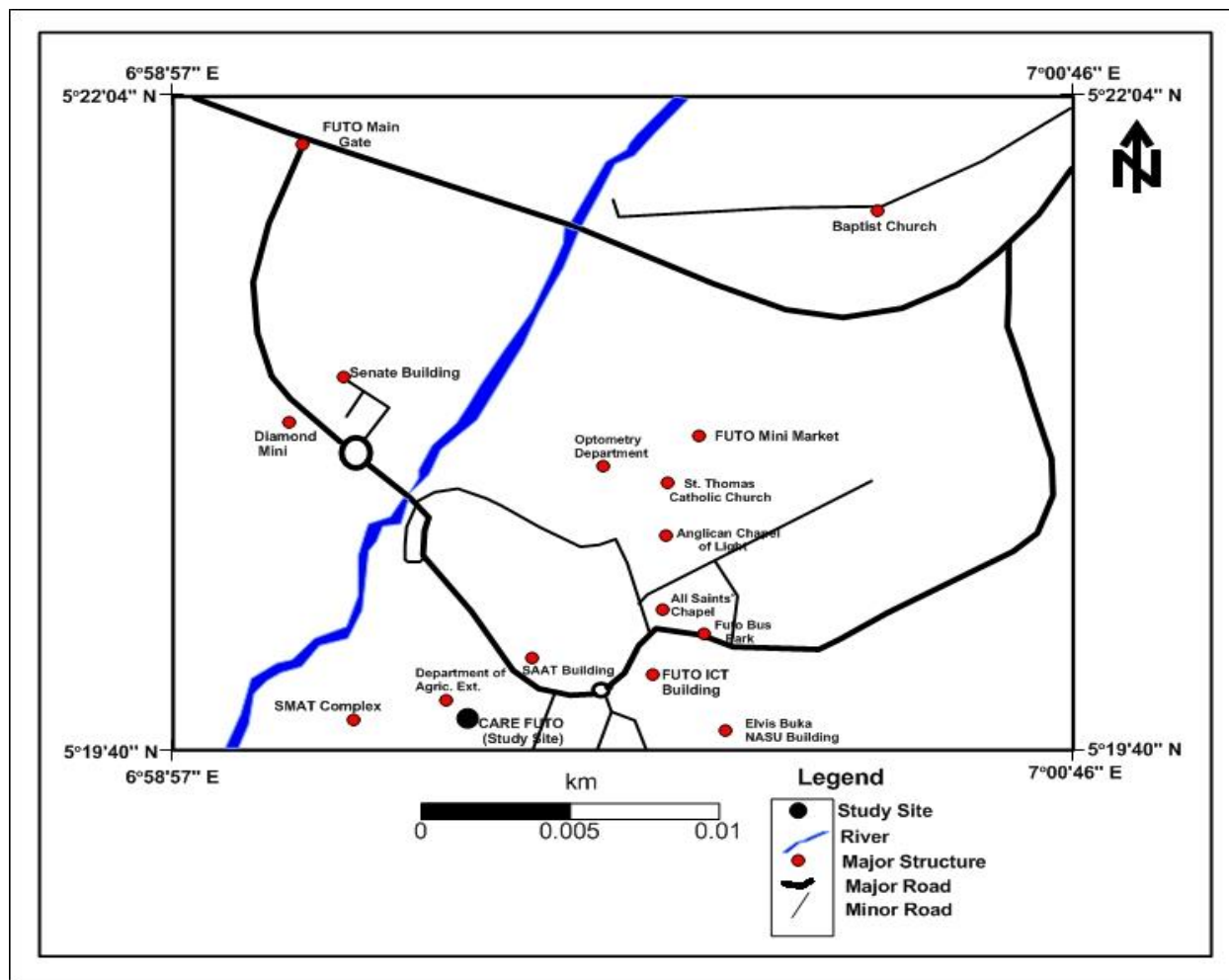


Figure 2: Map of Federal University of Technology Owerri Showing Study Site.

G. Data Collection

Growth Components

Data pertaining to growth components were determined as follows;

- Root weight, Shoot weight and Total biomass were determined by using a weighing balance.
- Shoot lengths were measured using a measuring tape.
- Tiller numbers were determined by counting the number of tillers from 9 plant stands from each plot and average computed.
- Leaf Area Index (LAI) was determined by taking randomly 9 plants from the middle of plot and determining the variable as follows:

$$\text{Leaf Area} = \text{Length} \times \text{Width} \times 0.75 \dots \dots \dots \text{equ (1)}$$

Where

Leaf Area = Length of the leaf (cm) x Width of the leaf (cm) x 0.75 as recommended

by Gomez (1972). Leaf area from each leaf was multiplied by the number of leaves per plant and per sampled area cm^2 . Leaf area index (LAI) was then calculated using the ratio:

$$\text{Leaf Area Index} = \frac{\text{Total leaf area (cm}^2\text{)}}{\text{Total ground area (cm}^2\text{)}} \dots \dots \dots \text{equ (2)}$$

from where the plants were sampled.

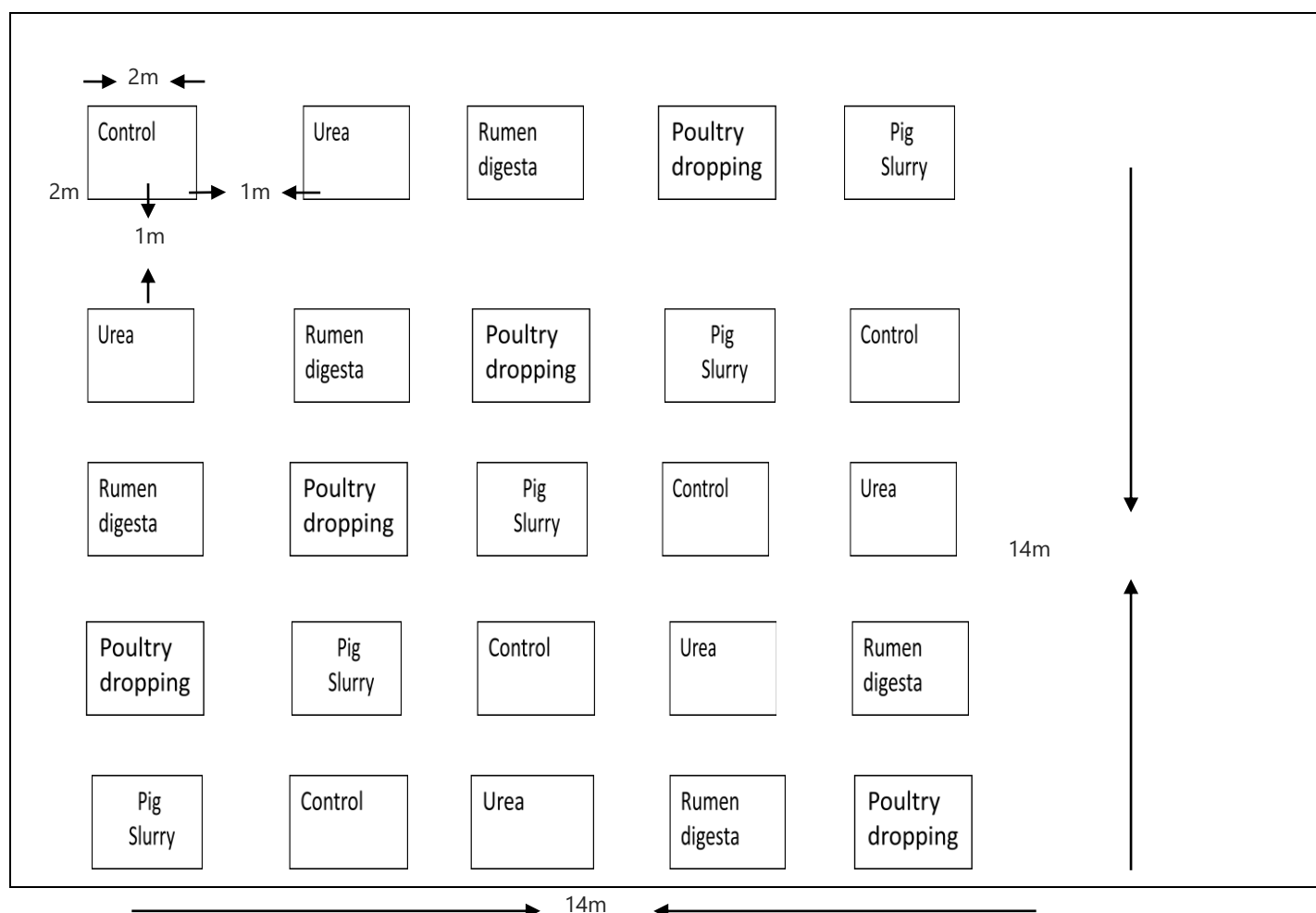


Figure 3: Field Layout and Treatment Allocation

H. Yield and Yield Components

Data pertaining to yield and yield components were determined as follows;

- The 1000 seeds were weighed using electric balance and the weight recorded.
- Percent (%) unfilled grains were obtained by weighing filled and unfilled grains. Then percentages of unfilled grains were obtained through the relationship between the weight of unfilled and total weight of grains.
- Grain yield weight were obtained by harvesting rice from one meter square area in each of the plot and then weighed. The paddy was then adjusted to 14% moisture content using the formula that follows, and then the grain weight for each plot was recorded and converted into $t\cdot ha^{-1}$ as described by Gomez (1972).

$$\text{Adjusted grain yield} = (A \times W) \dots \dots \dots \text{equ (3)}$$

$$\text{Adjusted Coefficient Computed by } A = \frac{100 - M}{86} \dots \dots \dots \text{equ (4)}$$

Where A is adjustment coefficient, M is the moisture content (%) of the harvested grains and W is the weight of the harvested grains.

I. Data Analysis:

The raw data collected were subjected to analysis of variance (ANOVA). The mean differences were separated using Fisher's Least Significant Difference at 0.05 probability level according to Gomez and Gomez, (1984).

3. RESULT AND DISCUSSION

Effect of treatments on Growth Parameters of the upland rice

The results on Growth Parameters recorded from the treated plots are presented in Table: 2

Leaf Area (cm)

There was no significant difference observed when the Leaf Area of the Control plot was compared with that of Urea treated plot. But there were significant differences when the leaf area of the Control plot was compared with Rumen digesta, Poultry droppings and Pig slurry treated plots. However, the Control plot recorded a value of 8.17 less leaf area than Urea treated plot and 15.91, 33.98, 37.46 less leaf areas than Rumen digesta, Poultry droppings and Pig slurry treated plots respectively. There was no significant difference when the leaf area of Urea treated plot was compared with Rumen digesta treated plot but there were significant differences when it was compared with Poultry droppings and Pig slurry treated plots. However, Urea treated plot recorded a value of 7.74 less leaf area than Rumen digesta treated plot and recorded 25.81, 29.29 less leaf area than Poultry droppings and Pig slurry treated plots respectively. There were significant differences when the leaf area of Rumen digesta treated plot was compared with Poultry droppings and Pig slurry treated plots. Rumen digesta treated plot recorded 18.07 and (21.55 cm) less leaf area than Poultry droppings and Pig slurry treated plots respectively. There was also no significant difference when the leaf area of Poultry droppings treated plots was compared with Pig slurry treated plot. However, Pig slurry treated plot recorded 3.48cm more leaf area than Poultry droppings treated plot.

Table 1: Mineral Composition of Organic Fertilizers Used for the Study

Organic Fertilizers	OC%	pH in H ₂ O	TN %	Av.P mg.kg ⁻¹	Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	TEB	TEA	ECEC	BS (%)
					Cmol.kg ⁻¹							
Rumen digesta	37.1	8.0	0.68	14.2	3.2	4.6	24.21	28.6	60.69	33.46	94.15	64.46
Poultry droppings	23.14	7.20	1.89	10.5	3.08	0.45	0.12	8.03	11.68	-	11.68	100
Pig slurry	32.12	6.6	2.58	4.60	2.42	0.45	0.60	0.20	3.67	0.16	3.83	95.82

%OC = Per cent Organic Carbon, TN = Total Nitrogen, Av.P = Available Phosphorus, TEB = Total Exchangeable Base, TEA = Total Exchangeable Acid, ECEC = Effective Cation Exchange Capacity, BS (%) = Percentage Base Saturation.

Leaf Area Index

There were significant differences when the Leaf Area Index of plant from the Control plot was compared with the leaf area index of those from treated plots. There were also significant differences when the leaf area indexes of plants from the treated plots were compared with one another. The Control plot recorded 1.21, 4.08, 8.50 and 9.36 less leaf area index than urea, Rumen digesta, Poultry droppings and Pig slurry treated plots respectively. Urea treated plot recorded 2.37, 6.79 and 7.65 less leaf area index than Rumen digesta, Poultry droppings and Pig slurry treated plots respectively. Rumen digesta treated plot recorded 4.42 and 5.28 less leaf area index than Poultry droppings and Pig slurry treated plots while Poultry droppings recorded 0.86 less leaf area index than Pig slurry treated plot.

Table 2: Effects of Treatments on Growth Parameters

Treatments	Root Weight (t.ha ⁻¹)	Shoot Weight (t.ha ⁻¹)	Total Biomass (t.ha ⁻¹)	Shoot Length (cm)	Leaf Area (cm)	Leaf Area Index	Tiller No
Control	1.21	3.38	4.59	42.73	28.05	7.02	11.2
Urea	0.84	4.44	5.27	50.64	36.25	8.73	18.4
Rumen digesta	1.11	3.89	5.00	60.12	43.99	11.10	14.4

Poultry dropping	2.37	9.67	11.94	67.00	62.06	15.52	16.4
Pig slurry	3.23	10.99	14.22	70.82	65.54	16.38	19.4
FLSD (p=0.05)	0.56	1.4	1.2	3.4	1.4	0.64	1.2

Tiller Number

There were significant differences when the Tiller number of the Control plot was compared with the tiller number from the treated plots. The Control plot recorded 7.2, 3.2, 5.2 and 8.2 less tiller number than Urea, Rumen digesta, Poultry droppings and Pig slurry treated plots. Again there were significant differences when the tiller number of Urea treated plot was compared with other treated plots. Urea treated plot recorded 4, 2, more and 1 less tiller number than Rumen digesta, Poultry droppings and Pig slurry treated plots respectively. Also, there were significant differences when the tiller number of Rumen digesta treated plot was compared with that of Poultry droppings and Pig slurry treated plots. Rumen digesta treated plot recorded 2 and 5 less tiller number than Poultry droppings and Pig slurry. Also there was significant difference when the tiller number of plant from Poultry droppings treated plot was compared with that of Pi slurry treated plot. Poultry droppings treated plot recorded a value of 3 less tiller number than Pig slurry treated plot.

Shoot Length (cm)

There were significant differences when the Shoot Length of plant from the Control plot was compared with those of the treated plots. There were also significant differences when the shoot lengths of the treated plots were compared with one another. The Control plot recorded 7.86, 17.34, 24.22, and 28.04 less shoot lengths than Urea, Rumen digesta, Poultry droppings and Pig slurry treated plots respectively. Urea treated plot recorded 9.48, 16.36 and 20.18 less shoot length than Rumen digesta, Poultry droppings and Pig slurry treated plots respectively. Rumen digesta treated plot recorded 6.88 and 10.7 less shoot length than Poultry droppings and Pig slurry treated plot respectively, while Poultry droppings treated plot recorded 3.82 less shoot length than Pig slurry treated plot.

Root Weight (t.ha⁻¹)

There were no significant differences when the root weight of rice plant from Control plot was compared with root weight of rice from Urea and Rumen digesta treated plot but there were significant differences when it was compared with those from Poultry droppings and Pig slurry treated plots. However, the Control plot recorded 0.37, 0.1 more root weight than Urea and Rumen digesta treated plot and recorded 1.16 and 2.02 less root weight than Poultry droppings and Pig slurry treated plots. There was no significant difference when the root weight of plant from Urea treated plot was compared with that from Rumen digesta treated plot but there were significant differences when it was compared with those of Poultry droppings and Pig slurry treated plots. However, Urea treated plot recorded 0.27 less root weight than Rumen digesta treated plot and 1.53, 2.39 less root weight than Poultry droppings and Rumen digesta treated plots respectively. There were also significant differences when the root weight of rice plant from Rumen digesta treated plot was compared with those of Poultry droppings and Pig slurry treated plots. Rumen digesta recorded 1.26 and 2.12 less root weight than Poultry droppings and Pig slurry treated plots respectively. There was significant difference when the rice root weight from Poultry droppings treated plot was compared with Pig slurry treated plot. Pig slurry treated plot recorded 0.86 more root weight than Poultry droppings treated plot. There were no significant differences when the shoot weight of the rice plant from the Control plot was compared with those from the Urea and Rumen digesta treated plot but there were significant difference when the shoot weight of the rice plant from the Control plot was compared with those from Poultry droppings and Pig slurry treated plots. However the Control plot recorded 1.06, 0.51 less values of shoot weight than Urea and Rumen digesta treated plot respectively, then 6.29 and 7.61 less shoot weight than Poultry droppings treated plots respectively. There was no significant difference when the shoot weight of the rice plant from Urea treated plot was compared with that from Rumen digesta treated plot but there were significant difference when it was compared with those of Poultry droppings and Pig slurry treated plots. However the Urea treated plot recorded 0.55 more shoot weight than Rumen digesta treated plot, then 5.23 and 6.55 less shoot weights than Poultry dropping and Pig slurry treated plots respectively. There was significant difference when the rice shoot weight from Rumen digesta treated plot was compared with those of Poultry droppings and Pig slurry treated plots. Rumen digesta treated plot recorded 5.78 and 7.1 less shoot weight than Poultry droppings and Pig slurry treated plots respectively. Also there was significant difference when the rice shoot weight of Poultry droppings was compared with that of Pig slurry. Poultry droppings treated plot recorded 1.32 less shoot weights than Pig slurry treated plot.

Effects of Treatments on Yield and Yield Components

Results on effect of Treatments on Yield and Yield Components are presented in Table 3.

Total Harvest (t.ha^{-1})

There were no significant differences when the Total Harvest of rice from the Control plot was compared with the total harvest from Urea and Rumen digesta treated plot but there were significant differences when the total harvest from the Control plot was compared with the total harvest from Poultry droppings and Pig slurry treated plots. However, the Control plot recorded values of 0.274 and 0.418 (t.ha^{-1}) less total harvest than Urea and Rumen digesta treated plots respectively, then 1.234 and 1.311 (t.ha^{-1}) less total harvest than Poultry droppings and Pig slurry treated plots respectively. There was no significant difference when the total harvest from Urea treated plot was compared with that from Rumen digesta treated plot but there were significant differences when Urea treated plot was compared with those of poultry droppings and Pig slurry treated plots. However the Urea treated plot recorded a value of 0.144 less total harvests than Rumen digesta treated plot, then 0.980 and 1.037 (t.ha^{-1}) less total harvest than Poultry droppings and Pig slurry treated plots respectively. Again, there were significant differences when the total harvest from Rumen digesta treated plot was compared with Poultry droppings and Pig slurry treated plots. The Rumen digesta treated plot recorded 0.836 and 0.813 (t.ha^{-1}) less total harvest than Poultry droppings and Pig slurry treated plots respectively. Also, there was no significant increase when the total harvest from Poultry droppings treated plot was compared with Pig slurry treated plot. However, Pig slurry treated plot recorded a value of 0.057 (t.ha^{-1}) more total harvest than Poultry droppings treated plot.

Table 3: Effects of Treatments on Yield and Yield Components

Treatments	Total yield (t.ha^{-1})	Filled Grain (t.ha^{-1})	Unfilled Grain (t.ha^{-1})	% Filled Grain	% Unfilled Grain	Weight of 1000 Seeds (g)
Control	1.202	1.152	0.050	95.84	4.160	56.8
Urea	1.476	1.366	0.110	92.55	7.455	55.3
Rumen digesta	1.620	1.584	0.036	97.78	2.222	58.3
Poultry droppings	2.456	2.384	0.072	97.07	2.932	63.8
Pig slurry	2.513	2.416	0.097	96.18	3.860	62.8
FLSD ($p=0.05$)	0.5	0.34	0.01	1.10	1.24	1.82

Filled Grain (t.ha^{-1})

There was no significant difference when the quantity of filled grain from the Control plot was compared with the total quantity of filled grain from the Urea treated plot, but there were significant differences when the quantity of filled grain from the Control plot was compared with those of Rumen digesta, Poultry droppings and Pig slurry treated plots. The Control plot however recorded a value of 0.214 less filled grain than Urea treated plot, then 0.432, 1.232 and 1.264 less filled grain than Rumen digesta, Poultry droppings and Pig slurry treated plots respectively. Again, there was no significant difference when the quantity of filled grain from Urea treated plot was compared with that from Rumen digesta treated plot but there were significant difference when it was compared with those of Poultry droppings and Pig slurry treated plot. However, Urea treated plot recorded a value of 0.218 (t.ha^{-1}) less filled grain than Rumen digesta treated plot while it recorded 1.018 and 1.050 (t.ha^{-1}) less filled grain than Poultry droppings and Pig slurry treated plots respectively. Again, there was significant difference when the filled grain of Rumen digesta treated plot was compared with those from Poultry droppings and Pig slurry treated plots. Rumen digesta treated plot recorded 0.800 and 0.832 less filled grain than Poultry droppings and Pig slurry treated plots respectively. Also, there was no significant difference when the quantity of filled grain from Poultry droppings treated plot was compared with that from Pig slurry treated plot. However, Pig slurry treated plot recorded a value of 0.032 (t.ha^{-1}) more filled grain than Poultry droppings treated plot.

Unfilled Grain (t.ha^{-1})

There were significant differences when the quantity of unfilled grain from Control plot was compared with those of the treated plot. There were also significant differences when the quantities of unfilled grain from the treated plots were compared with one another. The Control plot recorded 0.060 less, 0.014 more, 0.022 less and 0.049 less unfilled grains than Urea, Rumen digesta, Poultry droppings and Pig slurry treated plots respectively. Urea treated plot recorded 0.074, 0.038 and 0.013 (t.ha^{-1}) more unfilled grain than Rumen digesta, Poultry droppings and Pig slurry treated plots respectively. Rumen digesta treated plot recorded 0.036, and 0.061 more unfilled grain than Poultry droppings and Pig slurry treated plots respectively. Also Poultry droppings treated plot recorded 0.20 less unfilled grains than Pig slurry treated plot.

% Filled Grain

There were significant differences when the % Filled grain from Control plot was compared with those of the treated plots except % filled grain from Pig slurry treated plot that had no significant difference treated plot. However, the Control plot recorded 3.29 more, 1.94 less, 1.23 less and 0.34 less % filled grain than Urea, Rumen digester, Poultry droppings and Pig slurry treated plots respectively. There were significant differences when % filled grain from Urea treated plot was compared with those of Rumen digester, Poultry droppings and Pig slurry treated plots. Urea treated plot recorded 5.23, 4.52 and 3.63 less % filled grain than Rumen digester, Poultry droppings and Pig slurry treated plots respectively. There were no significant differences when % filled grain from Rumen digesta was compared with those of Poultry droppings and Pig slurry. However, Rumen digesta treated plot recorded 0.71 and 0.89 more % filled grain than Poultry droppings and Pig slurry treated plots respectively. There was no significant difference when % filled grain of Poultry droppings treated plot was compared with that of Pig slurry treated plot. However, Poultry dropping treated plot recorded a value of 0.89 more % filled grain than Pig slurry treated plot.

% Unfilled Grain

There were significant differences when the % unfilled grain from the Control plot was compared with those of Urea and Rumen digesta treated plot but there were no significant differences when it was compared with Poultry dropping and Pig slurry treated plots. The Control plot recorded 3.30 less % unfilled, 1.94 more % unfilled grain than Urea and Rumen digesta treated plots respectively. However, the Control plot recorded a value of 1.23 and 0.30 more % unfilled grain than Poultry droppings and Pig slurry treated plots respectively. Furthermore, there were significant differences when the % unfilled grain from the Urea treated plot was compared with those of Rumen digesta, Poultry droppings and Pig slurry treated plots. Urea treated plot recorded 5.23, 4.52 and 3.60 more % unfilled grain than Rumen digesta, Poultry droppings and Pig slurry treated plots respectively. Also, there was no significant difference when the % unfilled grain from Rumen digesta treated plot was compared with that of Poultry droppings, but there was significant difference when it was compared with Pig slurry treated plot. However, Rumen digesta recorded a value of 0.21 less % unfilled grain than Rumen digesta and the recorded 1.64 less % unfilled grain than Pig slurry treated plot. Also, there was no significant difference when % unfilled grain from Poultry droppings treated plot was compared with that of Pig slurry treated plot. However, poultry droppings treated plot recorded 0.93 less % unfilled grain than Pig slurry treated plot.

Weight of 1000 Seeds (g)

There were no significant differences when the weight of 1000 seeds grain from the Control plot was compared with those from Urea and Rumen digesta treated plots but there were significant difference when it was compare with those from Poultry droppings and Pig slurry treated plots. However the Control plot recorded 1.5more, 1.5 less seed weight than Urea and Rumen digesta treated plots respectively and recorded 7 and 6(g) less seed weight than Poultry droppings and Pig slurry treated plots respectively. There were significant differences when the weight of 1000 seeds from Urea treated plot was compared with those from other treated plots. Urea treated plot recorded 3,8.5 and 7.5(g) less seed weight than Rumen digesta, Poultry droppings and Pig slurry treated plots respectively. Furthermore, there were significant differences when the seed weight from Rumen digesta treated plot was compared with Poultry droppings and Pig slurry treated plots. Rumen digesta treated plot recorded 5.5 and 4.5(g) less seed weight than Poultry droppings and Pig slurry treated plots respectively. Also there was no significant difference when the seed weight from Poultry droppings treated plot was compared with that of Pig slurry Poultry droppings treated plot but however Poultry droppings treated plot recorded 1g more seed weight than Pig slurry treated plot. The differences observed in grain yield parameters within and among the treated plots could be associated with the different kinds of treatment used on the plots.

4. CONCLUSION

The result obtained from yield and yields components shows that the organic and inorganic manure added to the soil affected performance of yield and yield components differently. However, base on the record obtained from total harvest yield, pig slurry is the best treatment for irrigated upland rice on an *ultisol* followed by poultry droppings, followed by rumen digesta and then urea.

Recommendations

Pig slurry at the rate of 20t.ha⁻¹ is recommended first among the five treatments on *Ultisol* for optimum yield of CP 306 upland rice since total harvest was highest in pig slurry treated plot.

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Conflict of Interest:

The authors declare that there are no conflicts of interests.

Peer-review:

External peer-review was done through double-blind method.

Data and materials availability:

All data associated with this study are present in the paper.

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